

January 21, 1988

CD-88-02 (LD)

Dear Manufacturer:

SUBJECT: Catalyst Thermal Degradation Criteria Contained in
Advisory Circular No. 17F; Revision to Endnote #4

The purpose of this letter is to provide the industry with amended language to Endnote #4 of Advisory Circular (A/C) No. 17F (Subject: General Criteria for the Carryover and Carry-Across of Certification Data and the Carryover of Fuel Economy Data for Light-Duty Vehicles and Light-Duty Trucks). This revision does not in any way alter the policy contained in the A/C, it merely elaborates on and clarifies our existing policy.

The need for additional guidance became apparent during the past year when two small-volume manufacturers, who believed they were following the guidance provided by A/C No. 17F, Endnote #4, unsuccessfully attempted to measure maximum catalyst temperatures by locating thermocouples one inch upstream of the catalyst substrate, in free exhaust air. The intent of the A/C is to measure the maximum catalyst temperatures, and therefore requires thermocouples which are located inside the catalyst substrate (where the maximum catalyst temperatures occur).

To prevent future misunderstandings and to clarify the location of thermocouples in catalysts, we are revising the language to Endnote #4. Our revision also contains updated catalyst temperature criteria, making Endnote #4 consistent with our current evaluation criteria as contained in an internal memorandum dated November 18, 1982 (Subject: Release of A/C No. 17F) which was informally supplied to the industry in 1982 (copy enclosed).

For clarity, a complete set of endnotes is enclosed, with the revised language underscored or crossed out as applicable. If there are further questions, please contact your certification team member.

Sincerely,

Robert E. Maxwell, Director
Certification Division

Office of Mobile Sources

Enclosures

Revised: 1-21-88

ENDNOTES TO ADVISORY CIRCULAR NO. 17F

1. "Qualified to be grouped in the same engine family" means that the current year vehicle and the vehicle which generated the proposed carryover data must be identical in all the aspects listed in A/C No. 20B, Sections D, E, F (four-stroke, two-stroke, or rotary engines respectively).
2. "Qualified to be grouped in the same evaporative emission family" means that the current year vehicle and the vehicle which generated the proposed carryover data must be identical in all the aspects listed in A/C No. 59, Section D.
3. The same basic evaporative emission control system as specified in A/C No. 59, Section E.
4. It is the manufacturer's responsibility to assure that an increase in catalyst temperature will not result in increased thermal degradation of the catalyst. If the manufacturer has any reason to suspect that thermal degradation of the catalyst will increase significantly, carryover may not be approved. EPA believes that thermal degradation of the catalyst is not likely to increase if catalyst temperatures do not increase. EPA intends to look more closely at those cases where catalyst temperatures increase significantly. Criteria are offered below as a guideline to determine if catalyst temperatures are significantly affected. These criteria allow small increases in time and temperature to account for measurement variability. A manufacturer may determine that other criteria are more appropriate for establishing the acceptability of carryover for its designs. The manufacturer should document the basis for its determination that thermal degradation of the catalyst will not increase significantly. If a manufacturer believes that the following guideline is not appropriate for a particular situation and can document that thermal degradation of the catalyst will not increase even though these criteria are not met, durability carryover may still be approved. However, when the following criteria are not met, the manufacturer should notify EPA in writing at the time the carryover decision is made. This will allow most

timely EPA audit of the manufacturer's carryover decision. The amount of time spent in the following temperature intervals is not increased by more than three percent or 60 seconds, whichever is greater, during the mileage

accumulation cycle (approximately 2 hour cycle) unless there is a corresponding decrease in time at a higher temperature interval. The temperature intervals higher temperature interval. The temperature intervals are 601 C to 650 C, 651 C to 700 C, 701 C to 750 C, and 751 C to 800 C (other intervals within this range may be appropriate, the 60 second tolerance applies to a 50 C interval). If maximum temperatures are above 800 C, the maximum temperature is not increased by more than 2 percent and amount of time above 800 C is not increased by more than two percent or 30 seconds, whichever is greater. If the catalyst uses Al₂O₃ for support but does not contain Ni, only increases in time at temperatures above 700 C need to be considered. For oxidation catalysts which use Al₂O₃ for support but do not use Ni and do not use Rh, only increases in time at temperatures above 750 C need to be considered.

Whenever possible, the impact of a change on catalyst temperatures should be evaluated on a single vehicle, preferably the original durability-data vehicle. If the original durability-data vehicle is not available, the highest selling configuration from either of the model years is preferred. If it is not practical to evaluate the change on a single vehicle, other vehicle differences which could affect catalyst temperatures should be minimized. Again, configurations representing highest sales from each model year should be used if practical.

Thermocouples should be located to provide accurate measurement of maximum temperatures. Each manufacturer should obtain a description of such location from his catalyst supplier and retain this with the rest of the documentation. If this is not possible, for monolith catalysts, thermocouples may be located within the catalyst container (stricken out) substrate at the approximate mid-point (stricken out) radial center of the exhaust stream and approximately one inch downstream from the front face of the substrate. If the catalyst is composed of multiple containers or multiple substrate biscuits in the same container, more than one

thermocouple is required. Locate one thermocouple within each substrate biscuit as described above. Thermocouples should not be located in the exhaust pipe, in free exhaust air, or directly in the delivery path of secondary air injection systems.

5. Carryover may not be approved for any components or systems that were used in families certified without completing the 50,000-mile certification proveout under the small-volume provisions of 40 CFR 86.082-24(e).

Manufacturers must continue to submit requests to EPA for carryover involving systems or components that have not completed the 50,000-mile certification proveout. Requests for carryover may also be submitted to EPA if the 50,000-mile certification proveout has been successfully completed but a certificate was never obtained.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

ANN ARBOR. MICHIGAN 48105

November 18, 1982

OFFICE

OF

AIR. NOISE AND

RADIATION

SUBJECT: Release of Advisory Circular No. 17F, Criteria for
the Carryover and Carry-Across of Certification Data
and Carryover of Fuel Economy Data

FROM: Dave Ferris
Technical Support Section

MEMO TO: Addressees

THRU: Thomas M. Ball, Project Manager
Technical Support Section

Attached for your information is an advance copy of the new Advisory Circular (A/C) No. 17F -General Criteria for the Carryover and Carry-Across of Certification Data and the Carryover of Fuel Economy Data for Light-Duty Vehicles and Light-Duty Trucks. Please inform your staff that the A/C has recently been signed and will soon be published for general release.

This A/C serves two purposes. (1) It updates A/C No. 17E for references and incorporates previously established and implemented general policy (e.g., the policy revisions included in the July 1, 1981 letter). (2) It incorporates clarifying examples of particular designs which we have determined would give equivalent or superior deterioration performance, and therefore would satisfy the general provisions of paragraph X of A/C No. 17E. Some of these examples have been previously approved. The rest of the examples would have been approved if they had been requested. Using the abbreviated certification

review procedures and the examples provided, manufacturers would be able to "grant" themselves carryover subject to EPA audit and concurrence prior to certification. This should significantly streamline the administrative process, facilitating carryover.

Most of the items listed in section IX of this A/C can only be allowed if "catalyst thermal degradation does not increase significantly due to this change." Catalyst thermal degradation is a complex process depending on the composition of the support materials, the active materials, and the gas phase. This subject is discussed by K. Otto, W. B. Williamson, and H.S. Gandhi in "Durability of Automobile Catalysts," General Proceedings, May-June, 1981, pages 352-370.

It may be possible in many situations that catalyst temperatures may increase a certain amount without causing a significant increase in thermal degradation. It would be impossible to write general temperature criteria to cover every situation that will exist in the future. Regardless of the catalyst composition, however, we can be confident that if the amount of time the catalyst spends at any given temperature (and the maximum temperature) does not increase, the thermal degradation will not increase. The small increases in time and temperature that are allowed by the general criteria in the A/C are only allowed to account for measurement variability, not to allow actual increases.

The general temperature criteria listed in the A/C (above 600 C) are reasonably conservative for most catalysts used today, including a typical three-way catalyst containing platinum (Pt), Palladium (Pd), Rhodium (Rh), Alumina (Al₂O₃), and Nickel (Ni). If there are any cases where the temperature criteria are not met and EPA decides to audit the manufacturer's documentation, the following information may be helpful. In certain circumstances, thermal degradation would probably not increase and carryover would be appropriate even if time at certain temperatures does increase. If the catalyst uses Al₂O₃ for support but does not contain Ni, an increase in time at temperatures below 700 C is acceptable. For oxidation catalysts which use Al₂O₃ for support but do not use Ni or Rh, an increase in time at temperatures below 750 C is acceptable. If catalysts are developed in the future which do not use Al₂O₃ for support or Pt as an active material, we

will have to rely on the manufacturer for temperature information, etc.

If you have further questions on this A/C, please contact me.

Addressees: J. Bozek
B. Burgess
A. Kaupert
R. Nash
B. Patok

cc: R. Larson
R. Maxwell